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COMPUTERS IN SCHOOLS

The Report of the Minister's Task Force on
Computers in Schools
Executive Summary



June 1983

Alberta
EDUCATION

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C O M P U T E R S I N S C H O O L S

REPORT of the
MINISTER'S TASK FORCE on
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EXECUTIVE SUMMARY

JUNE, 1983

Alberta Education

PREFACE

On October 23, 1981, the Honourable David King, Minister of Education, announced his intention to establish a Task Force to study the use of computers in Alberta schools. In a speech delivered to the Annual Conference of the Alberta Society for Computers in Education, Mr. King stated, "I propose that the Task Force have 12 members, to reflect the broad base of interests in the project. It will be responsible for making recommendations regarding pertinent issues. These include the organizational and instructional implications of the use of computers, and the feasibility of establishing an educational courseware development and marketing capability in Alberta. The mandate would include proposing suggestions for long range planning, and for the instructional and administrative uses of computers in Alberta schools".

The Task Force on Computers in Schools was established by Ministerial Order on November 16, 1981. It was organized during the spring of 1982, was convened July 17, 1982, and concluded its deliberations April 18, 1983. With the addition of one more representative, the Task Force was constituted with thirteen members, drawn from the public-at-large and all major reference groups in education in Alberta.

Copies of the full report may be obtained from the Communications Branch of Alberta Education.

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I. TERMS OF REFERENCE

The Task Force was directed to review educational computing issues and make recommendations to assist the Minister of Education in forming policies and programs for the province. Specifically the terms of reference stated that:

. . . the Task Force shall have responsibility for reviewing problems and challenges, and for making recommendations to the Minister related to the following:

1. instructional implications of the use of computers in the province and in Alberta schools;
2. organizational implications of the use of computers in the province and in Alberta schools;
3. research studies that should be conducted relative to (1) and (2) above;
4. advisability and feasibility of establishing an educational courseware development capability within Alberta, including the best method(s) of setting up such a capability; costs associated with each method; courseware standards that should be established; and legal ramifications related to courseware development (e.g., copyright);
5. policies and practices re: introduction of computer hardware;
6. where Alberta schools should "be" in 3 to 5 years with respect to computers; and
7. such other matters as the Minister may refer to it from time to time.

II. INTRODUCTION

This report is concerned with the children of Alberta and the responsibility that we all share in helping them to prepare for rewarding and productive lives.

The members of this Task Force believe that the students in Alberta's schools must have opportunities to learn about computers and how to use them. Everyone will need this knowledge and these skills in the future, in their work and in their personal lives. Furthermore, the understanding of and the ability to use technology is a prerequisite to long-term economic prosperity for Alberta.

This Task Force was asked to review the use of computers in Alberta's schools over the next three to five years. With this in mind, a series of recommendations were produced which chart a direction we suggest should be followed. We feel that these recommendations will help educators maintain and improve the quality of education, while adapting to changing economic and social conditions.

This Task Force wants computers put to work in Alberta's schools, as aids to learning, instruction, and administration. We are excited by the potential of educational computing. Computers can be used to support and stimulate student learning, and can be used by teachers to improve the quality of education.

To be successful, the educational computing enterprise needs leadership at all levels, carefully developed plans, and sizeable amounts of money. Judging from the number and extent of local activities, there is obvious leadership potential that can be developed with appropriate support. With further experience and advanced training, planning capabilities can be strengthened and extended. However, progress depends upon funding support. We feel that investment in educational computing will yield direct benefits to the children of Alberta, to the province and to the country. It is an investment in people and in the future. Investing in human resources is of fundamental importance for humans alone are dynamic and have the capacity to create.

We feel that this endeavour deserves the attention of all Albertans, and would benefit from their support. Across the province, many people are enthusiastic and keenly interested in this subject. We want our education system to do more than keep in step with this interest - we expect educators to be leaders in adopting and adapting innovations of computers to the learning needs of students.

Our discussion of educational computing has been guided by an abiding concern for our children and their future. Every recommendation that we have made recognizes our shared responsibility to prepare the children of Alberta for a future which will be significantly different from the present. Much of the well-being of future generations and prosperity of our province depends upon this preparation.

We are on the verge of technical, economic, and educational change of an order not seen before. The question is not whether we can afford the effort and cost required to introduce computers into our schools. Rather, the question is whether we can afford NOT to do so.

III. RECOMMENDATIONS

A. STUDENTS AND CURRICULUM

Recommendation #1:

That by 1985 all students in Alberta schools shall have regular access to a computer learning station.

Recommendation #2:

That the Minister of Education initiate a review of the Program Studies to:

- introduce components related to technology and its current and future impact on society.
- adapt the sequence, structure, and design of the Program of Studies to accommodate continuous student progress and to encourage a personalized, self-directed learning approach.
- modify the content of appropriate courses to allow for the use of computers in ways that will stimulate the problem solving and creative abilities of students.

B. TEACHER TRAINING

1. Preservice

Recommendation #3:

That all students graduating from the Faculties of Education of Alberta's Universities after July, 1986, be required to have completed a computer literacy course.

Recommendation #4:

That the Board of Teacher Education and Certification prescribe the successful completion of a one semester computer literacy course as one of the prerequisites for graduation from an undergraduate program in a Faculty of Education in Alberta.

Recommendation #5:

That the Board of Teacher Education and Certification establish the successful completion of a standard, 40 hour computer literacy course as a requirement for the certification of teachers coming into Alberta.

Recommendation #6:

That the Faculties of Education in Alberta's universities offer major and minor specializations in educational computing.

2. Graduate Training

Recommendation #7:

That graduate programs in educational computing be offered by the Faculties of Education in Alberta Universities.

Recommendation #8:

That Alberta Education provide financial incentives to enable practising teachers to undertake graduate training in educational computing.

3. Inservice

Recommendation #9:

That an inservice program be developed and funded by Alberta Education, local jurisdictions, and the teaching profession to offer every practising teacher and educational administrator in Alberta the opportunity to learn the fundamentals of educational computing. Further, that implementation of an inservice program begin before the end of the 1983-84 school year.

4. Continuing Education

Recommendation #10:

That post secondary institutions and other agencies, such as further education councils, offer credit and non-credit courses in educational computing to teachers and interested members of the public.

C. COURSEWARE

1. Standards/Evaluation

Recommendation #11:

That Alberta Education continue and expand its work in courseware evaluation by further defining and disseminating content, instructional format, and technical design standards.

Recommendation #12:

That Alberta Education develop a capacity to evaluate educational software.

Recommendation #13:

That, where possible, Alberta Education cooperate with school jurisdictions, agencies and other provincial departments in the evaluation of courseware, and in establishing uniform standards for cataloguing and indexing, plus technical and pedagogical design.

Recommendation #14:

That all courseware be field tested by teachers and students in Alberta's schools, prior to being designated as "prescribed" or "recommended".

2. Clearinghouse/Distribution

Recommendation #15:

That Alberta Education continue to operate a central courseware clearinghouse and that all endorsed courseware meet Alberta Education's established standards.

Recommendation #16:

That buy-agreements continue to be made with the vendors of prescribed and recommended courseware and that this courseware be distributed, where practicable, through the School Book Branch of Alberta Education at the standard discount.

3. Development/Production

Recommendation #17:

That the Government of Alberta encourage the development of a courseware industry and that this encouragement be in the form of incentives, funding assistance, and shared research.

Recommendation #18:

That the Alberta Government introduce tax incentives that will encourage private investment in the courseware/software industry; further, that the Alberta Government encourage the Federal Government to introduce similar tax incentives.

Recommendation #19:

That the Government of Alberta encourage the Federal Government to address the issue of copyright of computer courseware/software.

Recommendation #20:

That the Government of Alberta provide national and international marketing assistance to Alberta courseware developers who are attempting to market their products elsewhere.

Recommendation #21:

That the Government of Alberta support the development of courseware in areas of special need; in particular, for gifted and talented and handicapped students.

Recommendation #22:

That quality courseware be sought to support the teaching of computer literacy; if not available, that it be immediately developed for use in Alberta.

Recommendation #23:

That Alberta Education utilize the services of ACCESS and other agencies, where possible, to co-acquire, reproduce, and distribute courseware/software.

D. HARDWARE

1. Evaluation and Acquisition

Recommendation #24:

That Alberta Education develop and establish standards for the acquisition of computer hardware according to proposed application and that these standards be reviewed annually.

Recommendation #25:

That Alberta Education negotiate selected, provincial buy-agreements with computer manufacturers who meet the established hardware standards, and that these buy-agreements be re-evaluated as hardware standards are reviewed.

Recommendation #26:

That school jurisdictions purchase computer hardware, where possible, from local dealers who will be responsible for distribution and service.

2. Distribution and Placement

Recommendation #27:

That there should be a minimum of one computer learning station for every eight students in a school.

Recommendation #28:

That for CAI and Business Education applications, one laboratory of computers for every 8 classrooms be established at the junior and senior high levels.

3. Networks

Recommendation #29:

That Alberta Education encourage the establishment of computer network systems and establish a central data bank to support these networks.

Recommendation #30:

That Alberta Education set network standards to enable school jurisdictions in the province to electronically communicate with each other and with centralized data bases.

4. Peripherals

Recommendation #31:

That Alberta Education encourage the development and introduction of computer peripherals that will enable all handicapped students, including physically handicapped, learning disabled, and developmentally delayed students to communicate with and use computers.

E. PLANNING

Recommendation #32:

That Alberta Education provide bold and decisive leadership in educational computing.

Recommendation #33:

That Alberta Education develop a comprehensive, strategic provincial plan for educational computing, which shall be reviewed at least once per year.

Recommendation #34:

That Alberta Advanced Education, in conjunction with Alberta's universities and Faculties of Education, develop a plan to implement those recommendations that have implications for teacher training, and that this planning be initiated as soon as possible.

Recommendation #35:

That each school jurisdiction in Alberta develop a multi-year plan for educational computing, to be reviewed and updated at least once per year.

Recommendation #36:

That each school jurisdiction appoint an individual to coordinate the development and implementation of its educational computing plan.

F. ORGANIZATION

Recommendation #37:

That Alberta Education establish an Educational Computing Branch within the Program Development Division of the Department.

Recommendation #38:

That Alberta Education create the position of Computer Consultant and assign at least one Computer Consultant to each of the Regional Offices of Alberta Education.

Recommendation #39:

That the Minister of Education consider establishing a Minister's Advisory Committee that would review directions, policies, programs, services, and other matters relating to educational computing.

Recommendation #40:

That advisory committees, reporting to the Director of Educational Computing, be established to provide advice on specific issues in educational computing and to keep the Director informed about developments within the province.

Recommendation #41:

That the Minister of Education encourage the establishment of a Committee consisting of senior representatives of government departments to assess the implications of high technology for the educational system, and for business and industry in the province.

Recommendation #42:

That the Minister periodically convene a public seminar to examine the social significance of technology and its implications to education.

G. FUNDING

Recommendation #43:

That the Government of Alberta establish an Alberta Heritage Foundation for Educational Computing to provide funding support for the recommendations of this report.

Recommendation #44:

That the Government of Alberta, through Alberta Education, provide the major portion of the funding and incentives to carry out the recommendations contained in this report.

Recommendation #45:

That the funding be provided in various forms, including earmarked grants, matching grants, and various incentives.

Recommendation #46:

That programs such as the Building Quality Restoration Program (BQRP) and the Educational Opportunities Fund (EOF) be continued, to provide financial assistance for hardware acquisition and educational computing projects.

Recommendation #47:

That model, 'high-tech' schools be established and jointly funded by Alberta Education and cooperating school jurisdictions.

Recommendation #48:

That Alberta Education establish a designated fund for the support of courseware development for students with special needs.

IV. RESEARCH AND IMPLICATIONS

A. RESEARCH

In the course of our discussions, we identified a number of issues that require further examination. Some fundamental questions arose which we could not answer; nor could others, as we deduced from a review of the published literature.

The issues we have identified need to be researched in a controlled, verifiable, and systematic manner. For certain purposes, the best means of investigation and assessment may be by demonstration and experimental projects, conducted perhaps in the 'model schools'. Careful efforts must be made to monitor these projects and evaluate the results of other educational computing activities. With the assistance of sound research, we can refine our approaches and enhance the benefits attained.

The issues we have identified include the following: the effects of computing on the learning process, the role of teachers, the organizational structure of schools, the mental and physical effects of computer use on students, and the implications of computers to social attitudes and relationships. The object of the research is to refine our understanding of specific matters so that we can make computers serve us better.

In due course, these questions must be addressed. The Director of Educational Computing, assisted by appropriate Advisory Committees, should decide research priorities and establish a long range research plan. Research studies should be tendered, according to practice, to interested individuals, school jurisdictions, universities, and consultants.

Research will require provincial government support. Recognizing the need for reliable research, we advise that this support be set at \$1.5 million per year, on average, for each of the next five years; approximately 50% of this amount could be used to support the model schools described above.

The following issues require further research:

1. In Computer Assisted Instruction, how much time at a computer learning station is desirable for each student? What guidelines are advisable to assist teachers in designing instructional strategies that incorporate CAI? At specified achievement levels, in particular subjects of study, what is the ideal? Are there useful measures of optimal times at a computer learning station, and appropriate sequencing and presentation of instructional material (e.g., tutorial, drill and practice, simulation, etc.)?

2. Are any of the conventional computer programming languages more or less suitable than others for the instruction of programming? For example, the Alberta Education Computer Literacy Pilot Project is finding that many children in Grade Four have difficulty in learning BASIC because of a conceptual problems with the notion of variables. Are there inherent differences between computer languages, relative to their structure and other variables, that impinge on their ease of learning, adaptability, and utility? How does this affect decisions regarding the selection and purchase of hardware?
3. Is the cognitive development of children affected by learning how to program and use computers? Can the effects, if any, be measured in a meaningful way? Does the learning of algorithmic and heuristic processes enhance creativity and problem solving? At what ages, and to what degree can average school children benefit from learning computer programming?
4. How can we implement alternative approaches to develop skills by using computer technology? Can the departmentalization of subjects be reduced by alternate, intergrated approaches of delivering instruction?

Which courseware designs are most effective in delivering instruction - specifically with reference to subject and achievement level? How can courseware be best designed to accommodate continuous student progress and effectively monitor individualized instruction?

5. What are the relevant ergonomic factors and what are the effects upon learning and the mental and physical wellbeing of the students and teachers? What practical measures can be taken to enable people to use equipment without discomfort or endangering their physical and mental health? What are the implications of prolonged exposure to video display terminals? In what way do ergonomic factors effect concentration, attention, and stress level of individuals?
6. Is there any relationship between age, gender, and computer use? What is the explanation for the reduction in interest in computing by girls as they advance to higher grades? Would equal use of computers affect the development of scientific and mathematic performance of girls as opposed to boys?
7. What are the most practical designs for the implementation of an interactive computer network? How can classrooms, schools, and administrative offices be effectively linked? What administrative functions can be best supported, in the short-term, by an interactive network? In its submission to the Task Force, the Edmonton Public School Board expressed strong interest in the potential of computer networks for administrative purposes.

8. What are the hardware requirements for classrooms, laboratories, and libraries? Given specific courses and student achievement levels, what are the ideal configurations, and ratios of students to computer learning stations. How can various types of hardware be effectively integrated into the learning process?

B. IMPLICATIONS

We draw a distinction between specific issues which require research and the broader implications of the widespread use of computers in schools. The implications are the social and structural consequences use of computers in schools. The following questions call for indepth assessment:

1. How will educational computing affect the role of teachers? Will the use of computers require teachers to modify the preparation and conduct of their instructional activities? Will the use of computers permit a significant increase in the amount of time available for individualization of instruction? Can use of computers alleviate some of the tension and stress that teachers experience? How will computers affect the attitudes of teachers?
2. What will be the impact of educational computing on the organization of classrooms and schools?
3. How will the use of computers affect the relationship between the home and the school? Will the locus of control of education shift dramatically to parents as more computers are acquired for home and personal use and quality courseware becomes available to the public? What are the implications of distance education? Will changes to the statutory provisions that relate to compulsory school attendance and home schooling be required to accommodate the delivery of education over a distance?

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

We have a reasonably clear vision of the future that we foresee for educational computing in Alberta. We wish to have our children graduate from school prepared to function and contribute to their community. We want the province to be prosperous enough to offer meaningful career opportunities to our school graduates so that they need not move away in search of challenge and reward.

Our recommendations direct the province toward that future. Let us summarize them to clarify 'where we think the province should be' in five years time.

Within the next 5 years, we foresee the following:

1. all students graduating from Alberta schools will be computer literate
2. all teachers graduating from Faculties of Education of Alberta universities will be computer literate. All those interested in computing will have an opportunity to study the instructional use of computers, in depth, as a specialty at both the undergraduate and graduate levels.
3. each school district in Alberta will have a minimum of one trained teacher on staff as a computer specialist to provide guidance, technical assistance, and support in instructional computing. In larger jurisdictions, other positions will be in place in administration and planning.
4. teachers who wish to, will have access to a computer for administrative purposes.
5. all schools in the province will have some computer hardware, in most cases microcomputers. They will cost much less in comparison with today's prices. In general, we foresee a minimum of one computer station for every eight students.
6. quality courseware will be more readily available and a courseware distribution network will be in place.
7. Alberta will have a viable courseware/software industry producing material for use in the province and elsewhere.
8. a structure will be in place within Alberta Education to provide technical and advisory support to Alberta school jurisdictions. Working closely with teachers, administrators, and trustees, officials from Alberta Education will establish hardware standards, negotiate buy-agreements with manufacturers, evaluate courseware, assist in courseware development and provide leadership in planning for uses of computers in Alberta schools.

9. instructional, informational and administrative computer networks will proliferate, linking together teachers, classrooms, schools, school jurisdictions, regions, and provinces. Networks will enable educators to share information resources (e.g., such as test item banks).
10. computers will virtually replace standard typewriters in the classrooms and offices of the province. In response to employer requirements, business education classes will continue to move towards microcomputers and a mastery of word-processing skills.
11. there will be legislation in place protecting the confidentiality of individual student data stored on computer information/data bases.

B. CONCLUSIONS

In this report, reference has been made to the astonishing rate of technological development that appears destined to continue without hesitation. These developments are agents of change that confront all of us - our lives and the means by which we acquire a livelihood are being strongly transformed.

We, the members of the Task Force, have put forward the view in this report that the students in the province's schools, indeed that students everywhere, must have an opportunity to learn about high technology and, particularly, computers. This is hardly a revolutionary notion. The independent initiatives of teachers, strong support of parents (some of whom have purchased computers for home use), and decisions made in other provinces and countries support this view.

Students will need computer knowledge and skills to understand and manage the changes they will face. School graduates must be prepared to participate in a competitive work world pervaded by computers.

Prevailing trends indicate that a technological capacity is fundamental to the long term prospects of an economically diversified province. Future job opportunities and career challenges depend upon the acquisition of this capacity. Of course, this holds true for the country as a whole. A recent Science Council of Canada study stated: "In the quest for survival that is sweeping a very competitive world, economic policy has now become technology policy. Can Canada compete?" The Task Force suggests we must try to do so.

This discussion of educational computing has been guided by an abiding concern for the children of Alberta and their future. We have identified a pressing and urgent need to introduce computers into Alberta's schools. The recommendations contained in this report, if followed, will encourage and support this enterprise. We hope that these recommendations will form the basis of decisive action and urge that they be given serious consideration.

We hope that our efforts have been of assistance to the Minister of Education and to all Albertans.

VI. MEMBERS OF THE TASK FORCE

Gene Romaniuk, Chairman, representing Alberta's universities; is a Professor of Education and Associate Chairman of the Department of Educational Psychology, Faculty of Education, University of Alberta, Edmonton.

Jim Humphries, Deputy-Chairman, representing the post-secondary technical institutions and community colleges; is the Program Head of the Micro-computer Management Program, Grant MacEwan Community College, Edmonton.

George Bevan, representing Alberta Education; is the Director of the Curriculum Branch, Alberta Education, Edmonton.

Bev Brooker, representing the public-at-large; is the President of B.W. Brooker Engineering Limited, Edmonton.

Caroline Brown, representing the public-at-large; is the editor of the Alberta Federation of Home and School Associations' Newsletter, Calgary.

Alvin Gross, representing the Alberta School Trustees Association; is a member of the Board of Education, County of Barrhead, Barrhead.

Herb Hallworth, representing the Alberta chapter of the Association for Educational Data Systems; is a Professor of Education, and Co-ordinator of the Computer Applications Unit, Faculty of Education, University of Calgary, Calgary.

Darvin Heinemann, representing the computer technology industry; is President of QRD Systems Consulting Limited, Edmonton.

Max Lindstrand, representing the Alberta Teachers' Association; is Vice-Principal of Camrose Composite High School, Camrose.

Larry Naidoo, representing the Conference of Alberta School Superintendents; is the Superintendent of Schools, Spirit River School Division #47, Spirit River.

Jim Thiessen, representing Alberta Education; is the Director of the Computer Technology Project, Alberta Education, Edmonton.

John Travers, representing the Department of Advanced Education; is an Educational Technologist in the Learning Systems Branch, Alberta Advanced Education, Edmonton.

Alison Vaness, representing the Curriculum Policies Committee; is a school trustee with the Calgary Board of Education, Calgary.

